MAGNIFIED LIGHTING DEVICE

Background of the Invention

The instant invention is directed to a flashlight illuminator which employs an LED light source in combination with a light ray assimilating and magnifying adapter or barrel which acts to accumulate and project the light emitted by the LED in a concentrated light beam over extended distances.

Traditional incandescent flashlights all have the ability to produce and project a confined light beam over a great distance while maintaining high intensity. The traditional flashlights use light bulbs and power sources i.e., batteries which have a limited life expectancy.

On the other hand, flashlights using Light Emitting Diodes (LED's) operate with a life expectancy which is typically a hundred fold greater than the incandescent products. The LED devices all have the same limitations i.e., a lack of light projection or light projection over limited distances and light projection of limited intensity.

There have been attempts to improve light projection and intensity of LED flashlights by using a concave reflecting dish, similar to that used in incandescent flashlights. These dishes were found to provide a more uniform light beam, however, it is highly defused and dim.

Accordingly, the instant invention has for its primary object to provide an adapter for use with an LED light source which acts to amplify, magnify and project the light produced by the light emitting diode.

Another object of the invention is the provision a flashlight with an LED light source which projects a light beam a distance substantially equivalent to that of an ordinary flashlight.

Another object of the invention is a penlight adapter capable of concentrating and magnifying the light emitted by the penlight in the form of a compact beam.

Another object of the invention is an adapter for attachment with a penlight having an LED light source which is capable of concentrating, magnifying and directing the light in the form of a concentrated beam.

Another object of the invention is the provision of an inexpensive adapter for use with LED lighting units.

Description of the Drawings

The construction designed to carry out the invention will hereinafter be described, together with other features thereof.

The invention will be more readily understood from a reading of the following specification and by reference to the accompanying drawings forming a part thereof, wherein an example of the invention is shown and wherein:

Fig 1 is a cutaway side view of the adapter in position with a penlight.

Fig 2 is a cutaway side view of a variation of the arrangement shown in Fig 1.

Fig 3 is a cutaway side view of the penlight with adapter showing light beams paths through the chamber and magnifying glass of the adapter.

Description of a Preferred Embodiment

Referring now to the drawings, the invention will now be described in more detail.

As can best be seen in Fig 1, the adapter 10 is shown connected with a penlight 12 which is of the type which uses LED light source 14. Penlight 12 comprises a casing or body portion which carries a usual power supply. An on/off switch 16 is provided to direct power to the LED and to interrupt the power to the LED as desired. While a penlight is shown it is noted that the adapter concept of the invention is equally usable with other types of LED flashlight illuminators.

Adapter or barrel 10 comprises an elongate tube or cylindrical encasement 18 preferably formed of plastic and formed to a length of about 1.5 to 3 inches with an inner diameter sufficient to receive forward end 19 of penlight 12. Tube 18 carries adjacent one end at least one "O" ring 20 for engaging with the outer surface of the penlight for securing and maintaining the adapter in position on the penlight. It is noted any other known securing or retaining arrangement may be substituted for "O" ring 20. Adjacent the opposite end and formed in the inner surface of adapter 10 is groove 22 which is about .03 inches in depth. Groove 22 is adapted to receive and secure magnifying lens 24 in position within the bore of tube 18. Between groove 22 and "O" ring 20, a raised ring 26 is formed about the inner surface of tube 18. Ring 26, along with lens 24 and the inner wall 31 of tube 18 define a substantially cylindrical cavity 30. The inner wall 31 of tube 18 is covered or lined with a reflecting member 32 which extends from ring 26 to lens 24.

Reflector 32 may be a separate piece formed of metal, plastic or paper with a glossy reflective inner surface or it may simply be a coating applied to inner wall 31. It is preferred that the reflecting surface be white although other colors or a mirror surface could be used.

Inner opening 28 of ring 26 is designed to engage and position the forward end of penlight 12 and more particularly, LED 14 in fixed position relative to lens 24. This is because the size of cavity 30 is critical.

It has been found to be most desirable that the diameter of cavity 30 be within a range of .375 to 1.25 inches and that the cavity length be .749 to .751 inches. Also, it has been found that lens 24 be a plano-convex lens with a diameter just slightly larger than the diameter of cavity 30 and a focal length of between .50 to 1.5 inches is most desirable. Further, it is preferred that the convex side of lens 24 have a radius of between .361 and 1.765 inches. Preferably, the lens is clear acrylic.

As earlier noted, the length of cavity 30, which defines the focal length of the adapter, is critical. For that reason, it is preferred that tube 18 be formed as a single unit. Ring 26 along with "O" ring 20 act to secure the penlight and more particularly LED 14 in fixed position relative to reflector 32 and lens 24.

In operation, penlight 12 is activated by switch 16 causing LED 14 to emit light. As best shown in Fig 3, the light rays 34 emerging from LED 14 are defused in all directions. The light rays when engaging reflector 32 are redirected and collected into lens 24. Lens 24 then acts to magnify the collected light rays delivering a condensed light beam 36 over a distance more than 10 times the normal projection length of a LED

penlight and with an increase in brightness of at least 25%. It is preferred that the beam diameter be controlled to have a diameter of no more than 12 inches at a distance of 8 feet from lens 24. The adapter is capable of controlling the beam diameter to be between 2 to 120 inches at a distance of 150 feet. The beam diameter selected is dependent upon the intended use.

It is noted that any of the known LED chips may be used with adapter 10 with similar results.

Turning now to Fig 3, adapter 10 is shown substantially as described in Fig 1 with the exception being the structure the bore forming cavity 30. In the arrangement shown in Fig 3, inner wall 31 is formed with a slight step down 33 adjacent inner ring 26. Step down 33 is very slight reducing the diameter of cavity 30 by between .75 and .25 inches. Reflector 32 is again arranged over the entire inner wall 31. Primarily, the purpose of step down 33 is to provide for a lens with a slightly larger diameter which is sometimes desirable.

Turning now to Fig 2 adapter 10 is shown with tube 18 formed as two interconnected members 38a and 38b interconnected with a threaded connection 40 which allows for longitudinal adjustment of cavity 30 by simply turning outer member 38b in the desired direction.

Again like elements are identified with the same numerals throughout to include lens 24, LED 14 and penlight 12. Reflector 32 may comprise overlapping pieces 42a, 42b which completely cover the inner surface of tube 18 and yet have the capability of slight longitudinal movement to accommodate axial adjustment of the cavity. It is

intended that axial adjustment be limited to between .361 and 1.765 inches.

While a preferred embodiment of the invention has been described using specific terms, such description is for illustrative purposes only, and it is to be understood that changes and variations may be made without departing from the spirit or scope of the following claims.